

ON THE

CAUSES OF GLEET,

AND ON THE

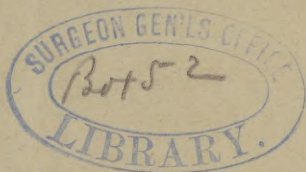
CALIBRE OF THE MALE URETHRA.

BY

HENRY B. SANDS, M.D.,

PROFESSOR OF ANATOMY IN THE COLLEGE OF PHYSICIANS AND SURGEONS; SURGEON
TO THE BELLEVUE AND ROOSEVELT HOSPITALS.

[REPRINTED FROM THE NEW YORK MEDICAL JOURNAL, MARCH, 1876.]



NEW YORK:

D. APPLETON & COMPANY,

549 & 551 BROADWAY.

1876.

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ON THE CAUSES OF GLEET, AND ON THE CALIBRE OF THE MALE URETHRA.¹

SURGEONS often pride themselves upon the certainty of their art when compared with that of medicine; yet the humiliating confession must be made, that many important surgical problems still remain unsolved. To survey our present knowledge concerning a common but obscure disease, may not prove an unprofitable task, and may stimulate us to renewed efforts in obtaining clearer and broader views respecting its pathology and treatment. I offer no apology, therefore, when I invite you to consider the nature of gleet—an affection which is sure to command the attention of every surgeon, both on account of its frequency, and of the difficulties that are often encountered in effecting its removal.

In recent times the term gleet has been employed in a very comprehensive sense, and has been made to refer to nearly every morbid urethral discharge, except that which is characteristic of acute urethritis. Thus we read of idiopathic gleet, due to the strumous or the gouty diathesis; of prostatic

¹ Read before the New York County Medical Society, January 24, 1876.

gleet, dependent on masturbation, vesical calculus, or piles ; and of gleet caused by the simple contact with the urethra of highly-acid urine. We shall avoid much confusion, I think, by giving to the word the restricted meaning which was ascribed to it by John Hunter, Sir Astley Cooper, and most of the earlier writers, who understood gleet to signify an imperfectly cured or chronic gonorrhœa. In this sense alone I shall employ the term ; and, although not prepared to deny the existence of the other varieties of gleet, I will say that I have very rarely met with any of them in practice.

Understanding, then, that gleet is only a sequel of gonorrhœa, I remark that there is no very clear line of distinction between gleet and its parent disease. The term gleet has reference partly to the character and partly to the chronicity of the discharge. After a gonorrhœal secretion has lasted for a period varying from one to four weeks, it almost always diminishes in quantity, while at the same time it becomes thinner and less opaque ; and a little later, in favorable cases, it disappears altogether, leaving the patient secure against a return of the disease, unless he is again exposed to contagion. Not unfrequently, however, the disease abates in intensity, but does not entirely disappear ; and the gleety discharge that remains may continue indefinitely, often for months, sometimes for years. The character and quantity of the discharge, too, vary as greatly as its duration. When most characteristic, it is thin, only slightly viscid, and nearly transparent ; at times, however, especially after excess in eating or drinking, it exhibits more distinctly the puriform character of the original gonorrhœal secretion. The quantity voided daily may be just sufficient to stain the linen moderately, or it may be almost imperceptible. Often it is noticed only in the morning after rising, or when it is caused to escape by pressure exerted along the anterior part of the penis and urethra. Usually, the disease is unattended with pain, and does not affect the general health. Some patients, however, suffer greatly from anxiety and depression of spirits, and all of them are liable to an aggravation of the disorder after excess or fatigue.

The brief outline of the symptoms of gleet which I have now given will serve to identify it as the affection with which

all of us are so familiar. Omitting, for the present, the consideration of its pathology, I will say a few words respecting its management and cure.

And, at the outset, it cannot be denied that in some cases—and these not always the least severe—recovery appears to take place spontaneously. I have known such recoveries to happen after the disease had existed for many months, and after the usual remedies had been employed in vain. These cases are rare, yet they certainly do occur, and the truth of my statement will, as I think, be confirmed by the experience of every surgeon present. But such instances are doubtless exceptional, and usually treatment, either local or constitutional, is required to eradicate the disease. Sometimes its removal is favored by a spare, at other times by a generous diet, combined with change of air and scene. Sea-bathing, and tonic food and medicines, have cured many a gleet that has resisted the ordinary specific remedies for this disease. But other kinds of constitutional treatment may be indicated; and the presence of a gouty, or strumous, or rheumatic diathesis, may call for its appropriate treatment, to aid in subduing the local disorder. Among internal remedies, *copaiba* and *cubebs* have always and deservedly been held in high esteem. Alkalies also, when largely diluted, are not without value in certain cases. In my own experience, however, local treatment has generally proved most efficient in the removal of gleet. Injections, either mild or strong, superficial or deep, according to circumstances, or the occasional introduction of a full-sized bougie into the bladder, have generally yielded satisfactory results. When these and other similar methods of treatment fail, the disease will often be found to depend on a stricture of the urethra, which, when discovered, should be got rid of by some one of the plans of treatment appropriate to that affection.

I have enumerated these items of treatment, because they will aid us in attempting a solution of the question which it is my chief object to discuss this evening; namely, the pathology of gleet, concerning which, as it appears to me, many surgeons at the present day hold views that are exclusive and erroneous.

In the first place, then, let us bear in mind that the term gleet denotes merely a symptom, and does not indicate the essential nature of the disease. Like the analogous word leucorrhœa, it has a vague meaning, and serves often to hide a great deal of ignorance. The muco-purulent character of the discharge proves it to be inflammatory; while we can be equally certain that it proceeds either from the urethra itself, or from some of the minute canals which open into this division of the genito-urinary tract. Pus secreted from any part of this extensive surface will probably issue from the external meatus in the form of gleet, but that which is the product of cystitis or pyelitis will escape only during micturition.

Regarding gleet, then, as a symptom of chronic inflammation, affecting some portion of the genito-urinary tract anterior to the bladder, what means have we at our command for determining more precisely the locality of the disease? Here we begin to feel that our resources are limited, and our knowledge imperfect; yet much light may be thrown upon this point from three sources, namely: *post-mortem* examination, the exploration of the urethra during life, and the effect of remedies upon the disease.

The pathological changes which *post-mortem* investigations have revealed as connected with gleet, are thus described by authors. Sir Astley Cooper wrote in 1826: "If you examine the urethra after death, you will find the following appearances: inflammation extending for two or three inches down the urethra, and if the urethra be laid open within twenty-four hours, it will be quite florid as far as the seat of the gleet, but pale in the other part. The discharge does not proceed from the vesiculæ seminales, or Cowper's gland, or the prostate, but from the lacunæ. The discharge commonly called gleet proceeds from the lacunæ of the urethra."¹ Rokitanski has observed "Tumefaction of the mucous membrane, enlargement of the follicles, relaxation of the sinuses, and a white or colorless secretion."² Sir Henry Thompson says: "Observation demonstrates that the two spots which suffer most from gonorrhœal inflammation are the fossa navicularis and the

¹ London *Lancet*, vol. iii., p. 271.

² "Pathological Anatomy," vol. ii., p. 179.

bulb; I have had opportunities of observing this two or three times in the dead-house on the bodies of patients who had been suffering from gonorrhœa shortly before death. Unusual vascularity is found in the latter situation, particularly if the affection have been chronic, while the intermediate part appears comparatively very little affected.”¹ Foerster remarks that “Blenorrhœa sometimes lasts for a very long time without causing any material alteration in the texture of the mucous membrane.”² Finally, stricture of the urethra has been frequently noticed at *post-mortem* examinations of persons who, during life, had suffered from obstinate gleet.

To sum up, then, the lesions that morbid anatomy has demonstrated to be connected with gleet, we find swelling and increased vascularity of the urethral mucous membrane, enlargement of the lacunæ, and sometimes organic stricture. On the other hand, the disease occasionally leaves no traces that can be discovered after death. Now, these records show plainly enough, to my mind, that the essential cause of gleet is a catarrhal inflammation of the urethral mucous membrane, and of the numerous follicles or lacunæ opening upon its surface. The textural changes—except when stricture is present—are usually slight, and in some cases, even when gleet has existed for a long period, no material pathological alterations can be detected. We notice here an evident analogy between the urethral and other mucous membranes. Nearly all of them, when inflamed, furnish a muco-purulent secretion, which may continue for a long time without leading to any striking textural changes in the parts affected. It is interesting to note the morbid alterations which have been observed in the lacunæ. Doubtless the implication of these slender and remote recesses will, in many cases, explain the obstinacy of the disease; for we cannot apply our remedies directly to the inflamed surface. The rebellious character of that chronic inflammation of the eyelids called *tinea ciliaris* is, doubtless, due to a similar cause, namely, the extension of the disease to the Meibomian follicles. Finally, it is also interesting to notice that there are two parts of the urethra which are

¹ On “Stricture of the Urethra,” p. 80.

² “Pathological Anatomy,” p. 553.

especially prone to chronic inflammation, namely, the fossa navicularis and the bulb. We shall find that these facts in morbid anatomy corroborate the results obtained by clinical observation.

In the second place, let us inquire how far the pathology of gleet can be deduced from an examination of the diseased parts during life. Sometimes the sensations of the patient afford a clew to the locality of the disorder. A feeling of itching, soreness, or smarting, in a certain part of the urethra, either during or after micturition, *may* coincide with the presence of inflammation at that part. Frequent desire to micturate *may* indicate an extension of the morbid process into the prostatic segment of the urethra. A sensation of straining and difficulty in voiding the urine may point to stricture as a probable cause or complication. In many cases, however, the patient experiences no morbid sensation, and is made aware of the existence of his disease only by the appearance of the gleet discharge.

The length and narrowness of the urethra render the visual examination of its deeper parts difficult and uncertain, and the endoscope has failed to fulfill the predictions that were made respecting its usefulness. Yet the instrument, doubtless, has a certain value, and by means of it we can often detect circumscribed spots of inflammation of the urethra, the affected portions of mucous membrane exhibiting an uneven, granular, and highly vascular surface. These granulations are sometimes abnormally sensitive, and readily bleed when touched. They are often present in the fossa navicularis, where their detection is easy, but they occur with greatest frequency in the bulb. Much stress has been laid upon the presence of these granular patches, both as a cause of gleet, and as a forerunner of stricture; yet it is an error to regard them as invariably present. They are absent in many, if not in most, of the milder cases, and cannot therefore be regarded as the sole cause of gleet. Many years ago Kleeburg¹ announced that, in certain cases of this disease, the glandular follicles studding the mucous membrane adjacent to the external meatus were swollen, red, and filled with muco-purulent

¹ "Schmidt's Jahrbücher," 1836, p. 35.

secretion ; and, having made the diagnosis, he readily effected a cure by probing the diseased ducts with the nitrate of silver. Robert¹ states that he has been able, in a number of instances, to cause an escape of pus from these follicles, by pressure made upon their walls. These observations I have confirmed by experience, and the facts are important, inasmuch as they render it highly probable that the lacunæ farther behind, which differ from these only in situation, are often affected in a similar manner. The deep-seated lacunæ cannot be satisfactorily examined during life, but we have *post-mortem* evidence that they are implicated in gleet.

The exploration of the urethra by means of sounds often affords much useful information, and, in obstinate cases, should never be neglected. When the point of the instrument passes over an inflamed patch of mucous membrane the patient will often complain of pain, yet not always, for sometimes the diseased parts are not very tender. In examining the prostatic portion of the urethra, we shall be misled if we fail to bear in mind the natural sensitiveness of this region. The special value of sounds, however, is that of enabling us to detect the presence of organic stricture, which is so often associated with gleet. In certain cases bulbous sounds afford the easiest means of determining the presence and locality of a stricture.

In the third place, the pathology of gleet is, in some degree, elucidated by observing the action of remedies upon the disease. The frequent success which follows the employment of topical astringents points to the catarrhal character of the inflammation, while the successful application of such remedies to certain limited parts of the urethra indicates that these parts are especially involved in the morbid process. Many gleet is cured by the introduction of stimulating ointments or powders into the fossa navicularis, while others, which are not benefited by this mode of treatment, yield readily enough when the remedies are inserted as far back as the bulb. The disappearance of a gleet after the removal of a stricture shows the dependence of the former on the latter ; while, in the absence of stricture, the persistence of a gleet for years, in

¹ "Maladies Vénériennes," p. 80.

spite of treatment, probably often coincides with a thickened and congested state of the urethral mucous membrane along its entire length. I have seen cases which I have thought to be of this description, in persons of intemperate and otherwise irregular habits, and it seems reasonable to suppose that the urethral mucous membrane should be liable to the same kind of inflammation as that which we so often observe in the lining of the urinary bladder.

We may now conveniently enumerate the following morbid conditions as causes of gleet:

1. Chronic inflammation of the urethral mucous membrane, either diffused over the greater part of its surface, or limited to particular spots—those most liable to disease being the fossa navicularis and the bulb.

2. Inflammation of the lacunæ which open into the urethra.

3. Stricture of the urethra.

4. Inflammation of Cowper's glands, the prostatic ducts, or the seminal vesicles. These, as well as chronic abscesses connected with the urethra, and warty vegetations studding its surface, are but very rarely causes of gleet.

I now propose to examine certain views respecting the pathology of gleet, which I find to be widely prevalent at the present day, and which have for their most earnest and able advocate, my distinguished colleague, Prof. Otis. They assume that gleet depends invariably on organic stricture, especially upon what are denominated strictures of wide calibre, and that the division of these by internal urethrotomy affords a method, and indeed the only method, of radical cure. To detect these strictures, certain special means of exploration are said to be necessary, and perhaps I cannot better set forth the views to which I allude than by quoting the following sentences from some of the latest contributions to the literature of this subject:

“Chronic gonorrhœa, gleet (also variously designated as prostatic, gouty, scrofulous), is dependent, as a rule, on abnormal contractions of the urethral canal. The only exception that I recognize (aside from the presence of polypoid or warty growths in the urethra) is the engorgement of ure-

thral sinuses, as the lacuna magna, or some one of those occasionally met with near the meatus, possibly deeper down, and these I have never found engorged unless more or less coarctation at an anterior point was also present. Gleet is always dependent upon stricture."¹ Again: "A constant relation appears to exist between the urethral calibre and the size of the penis with which it is associated. This is a fact demonstrated by careful measurements made with the urethra-meter in several hundred cases, without exception being met. The proportion runs as follows: when the flaccid penis measures 3 inches in circumference, the size of the urethra will be 30 millimetres in circumference, or more. When it is $3\frac{1}{4}$ inches, it will be 32 or more; $3\frac{1}{2}$ inches, 34; $3\frac{3}{4}$ inches, 36; 4 inches, 38; $4\frac{1}{4}$ to $4\frac{1}{2}$ inches, 40 or more millimetres."² The urethra-meter is an ingenious instrument, the extremity of which is capable of being expanded into a sort of fenestrated sphere by the action of a screw at the handle, the circumference of the part expanded being indicated by a steel hand traversing a dial-plate. To ascertain the normal calibre of a given urethra we are instructed to introduce the urethra-meter closed, "down to the bulbo-membranous junction. At this point the bulbous part of the instrument is to be expanded, by means of the screw at the handle, until a feeling of fullness is experienced, when, if there is no stricture at the point of trial, the hand on the dial-plate will indicate, with sufficient certainty, the normal calibre of the urethra under examination. Now, drawing the instrument slowly out, if stricture is present, the bulb will be arrested at that exact point. The screw is then turned, diminishing the size of the bulb, until it slips through the coarctation, when a glance at the dial will show the calibre of the stricture. This, subtracted from the figures indicating the normal calibre, will give the precise value of the contraction. The remainder of the canal, examined in the same way, brings the bulb finally to the meatus, when, in the same manner, the greater or less

¹ "Gleet, and its Relations to Urethral Stricture," by F. N. Otis, M. D., 1875.

² F. N. Otis, *op. cit.*, p. 254.

deviation from the normal size will be shown.”¹ “Vertical sections of the penis, from the junction of the glans with the body of the penis, show a uniform calibre throughout the fossa navicularis, to its external boundary at the meatus, the opening of which is of corresponding calibre. This may be accepted as the normal condition of these parts, and any variations from such uniformity may be considered aberrations from the normal condition.”² The strictures which are supposed to cause gleet need not be close; indeed, they are commonly such as would escape detection by the ordinary methods of examination. “If a urethra presents, the normal calibre of which is equal to a circumference of thirty millimetres of the French scale, and only twenty-nine of bulbous sound will pass without detecting obstruction, then the urethra is not ‘about right.’ It is strictured to the extent of one millimetre in circumference, and can never be a healthy urethra while that stricture remains.”³

Now let us inquire whether these statements can be verified. If so, we shall find established an important principle in the treatment of gleet.

I willingly admit that, if the healthy urethra has a uniform calibre, which can be ascertained and measured with precision, it will be possible to detect the slightest abnormal deviations from its size. We must, however, obtain a clear idea of what is meant by the *calibre* of the urethra, as the use of the phrase has a conventional rather than a literal signification. The word calibre is ordinarily employed to indicate the size of a tube, such, for example, as the bore of a gun. If the urethra were such a tube, and if its walls were firm and inelastic, there would be no trouble in determining its calibre. But anatomists have long recognized the fact that the urethra is *not* a tube, except when it is distended. Not only the mucous membrane which forms its immediate boundary, but the erectile and other tissues which surround it, are sufficiently elastic to close the channel completely, unless it is either

¹ “Gleet, and its Relations to Urethral Structure,” by F. N. Otis, M. D., p. 253.

² Dr. F. N. Otis, *NEW YORK MEDICAL JOURNAL*, April, 1874.

³ F. N. Otis on “Stricture of the Male Urethra,” p. 9.

naturally or artificially distended. This fact is readily demonstrated by transverse sections of the penis, both of the dead and of the living body. On examining the surface of such a section, we notice that the situation of the urethra is denoted merely by a linear depression, caused by the complete contact of the opposed urethral walls. This contact extends throughout the entire length of the urethra. By the expression calibre of the urethra, therefore, we are to understand the size of the canal when distended. Indeed, the phrase can have no other meaning. Now, as the urethral walls are elastic, it must be evident that the calibre of the urethra will vary within certain limits, depending upon the elasticity of these walls, and upon the amount of force used to separate them. Properly speaking, the normal calibre of the urethra would be its size when moderately distended by the urine during micturition; and, although we cannot estimate this with accuracy, we have reason to believe that it is not very large.

Anatomists have employed various methods for determining the calibre of the urethra, by experiments performed upon the dead subject. One of these methods consists in laying open the urethra by an incision along its entire length, and afterward stretching it out upon a flat board, and fastening it down with pins along the edges of the section. This has been done by Malgaigne, Jarjavay, Thompson, and others; and the specimen which I now exhibit has been prepared in this manner. It affords the following measurements, and is well adapted to display the *relative* calibre of different portions of the canal:

Meatus	21 millimetres.
Fossa navicularis,	38 “
Three inches behind meatus . .	26 “
Bulb	30 “
Membranous portion,	20 “
Prostatic portion	38 “

The best method of ascertaining the greatest possible distensibility of the urethra is undoubtedly that employed in 1852 by Reybard, who introduced into the canal an instru-

ment having at one extremity a pair of steel blades, which could be separated by turning a screw at the handle, the distance between the blades being indicated by a steel hand upon a dial, as in Dr. Otis's urethra-meter. Successive parts of the urethra were submitted to the action of these dilating blades, which were separated in every instance as far as possible, without causing a laceration of the urethral mucous membrane. The greatest separation of which the blades were capable was eighteen and a half millimetres.

Upon examining, in the manner described, a subject sixty years of age, Reybard found: 1. That the meatus could be dilated, without rupture, to double its natural size.

2. That, in that portion of the urethra corresponding with the middle of the penis, the blades could be separated fifteen millimetres, thus indicating a circumference of forty-six millimetres.

3. That in the bulbous, membranous, and prostatic divisions of the urethra, the instrument could be expanded to its greatest diameter, namely, eighteen and a half millimetres. This indicates, for all these parts, a calibre of at least fifty-eight millimetres.

On repeating the experiment in a subject of twenty-five to thirty years of age, Reybard found the same relative diameters in the different regions of the urethra, but found the diameter, in each of them, seven to eight millimetres less than in the older subject. I am not aware that any attempt has been made to ascertain whether the urethra of the living subject is capable of bearing such a degree of distention as was effected in these cases, yet I think it quite possible that the experiment would succeed if the dilatation were cautiously and gradually applied.

Another mode of estimating the calibre of the urethra is to obtain a cast of the canal, by injecting it with some kind of solidifiable material, such as fusible metal, plaster of Paris, or wax. I have tried all of these substances, and have found the latter to answer best. It is more manageable than either of the others, as it melts at a low temperature, and can be made to solidify quickly by being subjected to the action of cold water. Plaster of Paris does not run very easily when the

mixture is thick, and when it is thin it is slow to harden. Fusible metal makes a firm and durable cast, but it becomes solid at so high a temperature, and so quickly, that we can seldom be sure the canal has been fully distended. The casts which I exhibit have been made for me by Dr. Charles McBurney, the able demonstrator of anatomy in the College of Physicians and Surgeons, who has bestowed much time and care in preparing them. The urethræ which they represent were free from any evidences of disease. In all cases the nozzle of the syringe was introduced into a pouch of vesical mucous membrane, obtained by making a circular incision through the membrane, about an inch behind the internal orifice of the urethra, and then dissecting it up from the subjacent parts. By this means the urethra is more certain to be thoroughly distended than when the injection is thrown into the bladder, while at the same time the canal itself is not interfered with. To secure a perfect cast of the external meatus, a similar plan was pursued in all cases but one. Instead of closing the meatus by suture, a portion of the integument of the glans penis was dissected up, thrown forward over the meatus, and then surrounded by a ligature. It thus formed a pouch which received and retained the injection after it had passed through the meatus.

In making such an injection, the amount of force employed may be greater or less; and, accordingly, the distention of the urethra will be much or little; but in all cases the entire surface will be subjected to *equal* pressure; and, consequently, although preparations obtained in this manner may not afford a certain test of the relative calibre of different urethræ, they offer a perfectly reliable indication of the relative calibre of the different portions of any given urethra. I exhibit to you four casts, each one representing the entire length of the urethra. Cast marked No. 1 was made by the employment of a moderately distending force. In obtaining the remaining three, as much force was used as it was thought the urethral walls would bear without rupture. The accompanying table gives the dimensions of different parts of the urethra as indicated by the different casts. In all instances the figures represent the circumference in millimetres.

FIG. 1.



	No. 1. Æt. 40 to 50.	No. 2. Æt. 27.	No. 3. Æt. 40.	No. 4. Æt. 29.
Meatus.....	25	25	22	30
Fossa navicularis.....	30	44	40	43
Three inches behind meatus	32	36	35	36
Bulb.....	40	47	41	61
Membranous portion.....	20	25	26	30
Prostatic portion at its widest part.....	30	40	45	53
Internal meatus.....	18	35	50	40

Now, the comparison of these figures shows some curious results. Cast No. 1 is considerably smaller than the rest, and this fact may perhaps be accounted for by the moderate force that was employed in introducing the injection. The remaining three were all the result of the greatest distention it was thought safe to employ, yet they differ considerably in size, No. 4, especially, being larger than No. 2 or No. 3. I think it fair to assume that the varying size of casts 2, 3, and 4, indicates a corresponding variation in size in the respective urethræ, although it cannot be *proved* that the distending force employed in every instance was the same in amount. But assuming that it was so, or nearly so, we ascertain that the dimensions of the adult male urethra vary in different individuals. Whether these variations bear any definite ratio to the circumference of the penis, is a question that it will be convenient to postpone for the present. I will only add, in this connection, that the facts here demonstrated on the subject confirm the observations that have long ago been made by surgeons and anatomists, who have generally admitted differences in the calibre of healthy urethræ.

The table also shows that the calibre of the urethra, especially of its bulbous portion, is, in some instances, much greater than it would appear to be from any examinations which have ever been made to ascertain its size during life. This statement agrees with the results already obtained by Reybard, in the experiments I have alluded to.

But the special value of the figures is the unfailing indication which they afford of the want of uniformity in calibre of

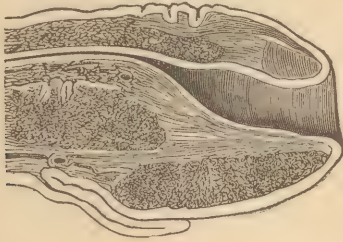
different parts of the same urethra. This is no new fact, yet the recognition of it is so important in the present discussion, that I may be pardoned for setting it clearly before you.

We notice, then, in examining any one of these casts, that it represents the urethra as displaying a series of alternating contractions and dilatations throughout its entire course. The meatus is generally contracted; then follows a dilatation, somewhere in the glans penis, the fossa navicularis; behind the fossa navicularis the urethra is again narrowed for a distance of several inches, when it expands more or less gradually to form the bulb; behind the bulb is a third contraction, corresponding with the membranous division of the urethra; and finally we reach the last dilatation in the prostatic portion, and the last constriction at the internal meatus. We thus observe three dilatations, namely, in the fossa navicularis, the bulb, and the prostate; and four contractions, these being at the meatus, behind the navicular fossa, throughout the membranous portion, and at the internal orifice of the urethra. These dilatations, as is well known, are all found along the inferior wall or floor of the canal. I note the fact, in passing, that, with one exception, these casts demonstrate the bulb to be the widest or most dilatable portion of the canal. The prostatic portion is said to be the most dilatable, but, owing to the firmness of the tissues which surround it, great force is needed to expand it. In cast No. 3 the bulb is not so wide as the prostatic portion, yet it is wider than any part situated in front of it.

These contractions and dilatations of the different parts of the urethra have long been familiar to anatomists, and have seldom been called in question. Their presence is tacitly denied, however, when it is affirmed that the calibre of the urethra is indicated by the dimensions of the bulb. The dilatation called the fossa navicularis was known to the older anatomists; it was described by Vesalius and Morgagni, and has been admitted by all authors with whom I am acquainted, except Amussat and Dr. Otis. Amussat denied its existence; but the arguments which he employed are by no means convincing, and have been fairly refuted. Dr. Otis also denies the existence of the fossa navicularis, and regards the

presence of a narrow meatus as abnormal. He says: "Vertical sections of the penis, from the junction of the glans with the body of the penis, show a uniform calibre throughout the fossa navicularis to its external boundary at the meatus, the opening of which is of corresponding calibre. This may be accepted as the normal condition of these parts, and any variations from such uniformity may be considered aberrations from the normal condition."¹ Dr. Otis does not state, however, that he has ever made these sections himself, and he is in error when he quotes the authority of Henle in support of

FIG. 2.



his assertion. The accompanying plate,² which is borrowed from that anatomist's work, is designed by its author to illustrate the arrangement of the erectile and other tissues in the glans penis; and, moreover, Henle³ states distinctly in the text that the meatus and the membranous portions are the narrowest parts of the urethra. He gives seven millimetres as their average diameter. Now, the correctness of this statement is capable of the easiest demonstration. I am well aware that a very wide meatus is occasionally seen, but the opening is usually narrow when compared with the urethra behind it, and I cannot avoid the conclusion that Prof. Otis has mistaken the exception for the rule.

There is a peculiarity respecting the anatomy of the fossa navicularis, which I have not seen mentioned by anatomists, and which is illustrated by the casts now exhibited. I may remark that I have noticed the same peculiarity in the diving

¹ Dr. F. N. Otis, NEW YORK MEDICAL JOURNAL, April, 1874.

² J. Henle, "Anatomie des Menschen," vol. ii., p. 424.

³ *Op. cit.*, vol. ii., p. 393.

body—I refer to the situation of this fossa. It is always found in the glans penis; but, while in some instances it is distant three-quarters of an inch or more from the meatus, in others it is placed almost immediately behind this opening. When it is situated at some distance from the meatus, that part of the urethra which lies in front of it is usually narrow, and of uniform diameter. When it is found directly behind the meatus, it appears as an abrupt dilatation, as in cast No. 3, when the meatus measures twenty-two millimetres, and the fossa navicularis forty millimetres, in circumference. In some cases, as in that represented by cast No. 1, the fossa navicularis is only slightly marked, but I have rarely known it to be entirely absent.

Now, it may be objected to the statements I have thus far made, that they relate merely to the dead subject, and that the preparations which I have shown cannot indicate either the absolute or the relative calibre of the urethra in the living body. Accordingly, I have made some investigations with the view of correcting any errors that might have arisen from the study of the cadaver alone. I have been induced to proceed with great caution, however, in this matter, to avoid the injury to the urethra that might otherwise result.

In practice, we find in the size of the meatus a rough test of the calibre of the urethra. As this is generally as narrow as any other part of the canal, we assume that the largest sound it will admit ought easily to traverse the entire urethra, unless stricture is present. And this rule I have usually found a good one, although, when the meatus is exceptionally small, it may be desirable to enlarge it, either for the introduction of a full-sized lithotrite, or for the examination of a stricture which is not very tight. But, unless the meatus is unusually large, the *greatest* calibre or distensibility of the urethra cannot be tested by the largest sound that will pass through this opening, and I have found the ingenious instrument devised by Dr. Otis of great value in conducting this part of the investigation. I am unable, however, to obtain with the urethra-meter the same results as those recorded by Dr. Otis.

In the first place, I can discover with it no exact ratio be-

tween the calibre of the bulb of the urethra and the circumference of the penis. On the one hand, the circumference of this organ, even in its flaccid state, is liable to variation; and, on the other, the "feeling of fullness" that is said to indicate the distension of the urethra is, so far as I am able to appreciate, no reliable sign that the walls of the canal have been fairly stretched. I have carefully examined the urethræ of twenty healthy adults, and, with a single exception, I have succeeded in expanding the urethra-meter to its fullest extent, namely, forty-five millimetres, without causing pain or inconvenience. In many of these instances I have been able to move the instrument, while thus expanded, forward a distance of an inch or more, without encountering resistance. I infer, from these results, that the bulb of the urethra in the living subject is generally capable of greater dilatation than can be effected with the urethra-meter, and that this instrument has failed to prove the existence of a definite ratio between the calibre of the urethra and the circumference of the penis.

In the second place, I have always found, when the instrument was expanded so as to distend only moderately the bulb of the urethra—and yet more freely within it—that, on attempting to withdraw the instrument, it would be arrested about one inch in front of the bulb, and that it became necessary to reduce its size before it could safely be drawn forward. It would then pass on easily until its expanded portion reached the meatus, when generally a further reduction became necessary before it could be finally withdrawn. In short, while the urethra-meter, in my hands, has failed to indicate the exact calibre of the urethra, as compared with the size of the penis, it has shown variations in the distensibility of its different parts, corresponding with those which have been demonstrated by the employment of injections in the dead subject.

The application of these facts is at once easy and important. If they can be verified, they prove indubitably that the assumption of an unvarying calibre for any urethra is unwarrantable; and it is plain that such an assumption must lead to the gravest errors in practice. If the calibre of the bulb of the urethra be taken as an indication of what the calibre of all parts of the canal in front of it *ought* to be, I cannot un-

derstand why stricture will not frequently be diagnosticated when none really exists. And, when it is remembered that not less than fourteen strictures in the same urethra have been supposed to be revealed by this mode of examination, we may reasonably suspect, in the absence of *post-mortem* evidence, that there is something fallacious in the method employed. In fact, I am convinced that, when a healthy urethra, which has not been previously stretched, is explored, either with the urethra-meter, or with very large bulbous sounds, the instrument will often be tightly grasped at certain points, and communicate to the examiner a deceptive sensation, as if a stricture were present. This may possibly arise from one of several causes, as, for example, a deviation of the sound from the axis of the canal, a spasmodic contraction of the muscular fibres that surround the urethra, or a puckering of its mucous membrane before the instrument. Another explanation is suggested by certain interesting appearances in the urethral casts which I have just exhibited. Instead of presenting a smooth and even surface, they are often marked by slight transverse furrows and alternating ridges, indicating that the urethral mucous membrane, when greatly distended, yields more readily at some points than at others.

I should be sorry to have it inferred, from anything I have said, that I am opposed to the operation of internal urethrotomy for the cure of stricture. Some of the most gratifying results in modern surgical practice have been achieved by this method, but I believe it to be applicable chiefly to the treatment of close strictures, and as an auxiliary to dilatation. The dilating urethrotome, invented by Reybard many years ago, never met with general favor, on account of the accidents which attended its use, and the success of safer and milder methods of treatment. I am a firm believer in what, I fear, is becoming an old-fashioned doctrine among us, namely, that gradual dilatation is far the best treatment yet discovered for the great majority of urethral strictures. In regard to what are termed strictures of large calibre, I believe that they rarely exist, and that, when they do, they seldom cause the symptoms which have been ascribed to them. I fully indorse the statement made by Sir James Paget, who says: "Every year

teaches me more and more plainly that a very large number of cases of stricture of the urethra are not really dependent on any fixed condition of the urethra, but upon mere swelling of its mucous membrane, upon just such swelling as, with chronic catarrh, narrows or shuts up one or both nostrils. Manual surgery should find little or nothing to do in cases such as these."¹

I desire also to express my disapproval of the habitual use of *very* large sounds, as I believe that a sound exceeding twenty-five millimetres in circumference is rarely necessary, either for the diagnosis or treatment of a urethral stricture, and that a canal, even smaller than this would indicate, may permit the ready evacuation of the bladder. The fact that the urethra *can* be distended considerably beyond this limit is no proof that it ought to be, and unquestionably much evil may result from over-distention.

Finally, I cannot help thinking that the practice of slitting up the meatus, now so much in vogue among us, is injurious and irrational. The normal meatus is narrow, and its small size doubtless favors the projection of the stream of urine during micturition. When it is enlarged by a free incision along the floor of the urethra, the penis is thereby deformed, and a condition of artificial hypospadias is established. Except in special cases, therefore, it ought to be left as Nature has made it.

If, upon all these matters, I have stated my convictions somewhat emphatically, it is because I am deeply impressed with their important bearing in practice. My sole object has been to elicit truth; and, if I have ventured to criticise freely, I am willing that my own views shall be criticised in the same candid spirit.

¹ "Clinical Lectures and Essays," London, 1875.

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